

6/

(As Filed) A network management architecture, comprising:  
a master node, wherein  
said master node is one of a plurality of nodes,  
each of said nodes is communicatively coupled to another of said nodes by at  
least one of a plurality of optical links,  
said nodes comprise a network,  
said master node is configured to manage said network by virtue of being  
configured to perform a network management activity, and  
said network management activity comprises at least one of discovery,  
implementation, assurance, and restoration, of a virtual path.

7/

(As Filed) The network management architecture of claim 6/ , wherein  
said master node maintains topology information regarding a topology of said  
network.

8/

(As Filed) The network management architecture of claim 6/ , further  
comprising:  
a backup node, wherein  
said backup node is configured to perform said network management activity, if a  
failure in said network prevents said master node from performing said  
network management activity.

9/

(As Filed) The network management architecture of claim 7/ , wherein  
said backup node maintains first topology information regarding a topology of said  
network.

10/

(As Filed) The network management architecture of claim 7/ , wherein  
said master node maintains second topology information,  
said master node is configured to update said first topology information by sending  
said second topology information to said backup node.

11. (New) The network management architecture of claim 9, wherein  
said master node maintains second topology information,  
said backup node is configured to update said first topology information by receiving  
said second topology information from said master node.

12. (New) The network management architecture of claim 3, further comprising:  
a standby node, wherein  
said standby node is configured to perform said network management activity,  
if said failure prevents said master node and said backup node from  
performing said network management activity.

13. (New) The network management architecture of claim 7, wherein  
said standby node maintains first topology information regarding a topology of said  
network.

14. (New) The network management architecture of claim 8, wherein  
said backup node maintains second topology information,  
said backup node is configured to update said first topology information by sending  
said second topology information to said standby node.

15. (New) The network management architecture of claim 9, wherein  
said master node maintains third topology information,  
said master node is configured to update said second topology information by sending  
said third topology information to said backup node.

16. (New) The network management architecture of claim 8, wherein  
said backup node maintains second topology information;  
said standby node is configured to update said first topology information by receiving  
said second topology information from said backup node.

17. (New) The network management architecture of claim 11, wherein  
said master node maintains third topology information,  
said backup node is configured to update said second topology information by

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receiving said third topology information from said master node.

18 13. (New) The network management architecture of claim 1, further comprising: a plurality of standby nodes, wherein

said standby node is one of said standby nodes, <sup>12</sup> ?

each of said standby nodes is assigned a priority, and

said each of said standby nodes is configured to perform said network management activity, if said failure prevents said master node, said backup node and any ones of said standby nodes having a higher priority than said each of said standby nodes from performing said network management activity.

19 14. (New) The network management architecture of claim 13, wherein <sup>18</sup> each of said standby nodes maintains first topology information regarding a topology of said network.

20 15. (New) The network management architecture of claim 14, wherein <sup>19</sup> said backup node maintains second topology information, said backup node is configured to update said first topology information by sending said second topology information to said each of said standby nodes.

21 16. (New) The network management architecture of claim 15, wherein <sup>20</sup> said master node maintains third topology information, said master node is configured to update said second topology information by sending said third topology information to said backup node.

22 17. (New) The network management architecture of claim 14, wherein <sup>19</sup> said backup node maintains second topology information, said each of said standby nodes is configured to update said first topology information by receiving said second topology information from said backup node.

23 18. (New) The network management architecture of claim 17, wherein <sup>22</sup> said master node maintains third topology information, said backup node is configured to update said second topology information by

receiving said third topology information from said master node.

*24* 19. (New) A method for centralized control of a network, wherein said network comprises a plurality of nodes, comprising:

creating an authoritative topology database on a master node of said network, wherein each of said nodes is communicatively coupled to another of said nodes by at least one of a plurality of optical links,

said authoritative topology database contains topology information regarding a topology of said network,

said master node is configured to manage said network by virtue of being configured to perform a network management activity, and

said network management activity comprises at least one of discovery, implementation, assurance, and restoration, of a virtual path.

*25* 20. (New) The method of claim *19*, wherein said creating said authoritative topology database comprises:

sending an IAM\_MASTER message to a neighbor node, wherein said neighbor node is a neighbor of said master node.

*26* 21. (New) The method of claim *20*, wherein said creating said authoritative topology database further comprises:

sending a positive reply from said neighbor node to said master node, wherein said reply comprises at least one of

a node identifier for said neighbor node,

a node type of said neighbor node, and

a system inventory for said neighbor node.

*27* 22. (New) The method of claim *21*, wherein said creating said authoritative topology database further comprises:

forwarding said IAM\_MASTER message from said neighbor node to another of said nodes.

*28* 23. (New) The method of claim *22*, wherein said creating said authoritative

topology database further comprises:

sending another positive reply from said another of said nodes to said neighbor node,  
wherein

said another positive reply comprises at least one of  
a node identifier for said another of said nodes,  
a node type of said another of said nodes, and  
a system inventory for said another of said nodes.

29

24. (New) The method of claim 19, further comprising:

synchronizing said authoritative topology database and a topology database  
maintained on one of said nodes.

30

25. (New) The method of claim 24, wherein said synchronizing comprises:

sending a copy of said authoritative topology database to said one of said nodes,  
wherein

said one of said nodes is a backup node,

said backup node maintains said topology database, and

said backup node is configured to perform said network management activity,  
if a failure in said network prevents said master node from performing  
said network management activity; and

replacing said topology database with said copy of said authoritative topology  
database.

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26. (New) The method of claim 25, wherein said synchronizing further comprises:

sending a copy of said authoritative topology database to another of said nodes,  
wherein

said another of said nodes is a standby node,

said standby node maintains another topology database, and

said standby node is configured to perform said network management activity,  
if said failure prevents said master node, said backup node and any  
ones of said standby nodes having a higher priority than said each of  
said standby nodes from performing said network management activity;

and

replacing said another topology database with said copy of said authoritative topology database.

*32*  
*32* 21. (New) A method for determining a topology of a network, wherein said network comprises a plurality of nodes, comprising:

receiving a message at a node, wherein

said message is sent by a master node, and

each of said nodes is communicatively coupled to another of said nodes by at least one of a plurality of optical links;

forwarding said message to a neighbor node, wherein said neighbor node is one of said nodes that is a neighbor of said node; and

sending a positive reply to said master node.

*33*  
*33* 28. (New) The method of claim *21*, wherein said node and said master node are ones of said nodes.

*34*  
*34* 29. (New) The method of claim *21*, wherein said message is an IAM\_MASTER message.

*35*  
*35* 30. (New) The method of claim *21*, further comprising:

determining if said message can be forwarded.

*36*  
*36* 31. (New) The method of claim *30*, wherein said determining if said message can be forwarded comprises:

updating a hop count of said message;

comparing said hop count to a maximum hop count; and

forwarding said message if said comparison indicates that said message can be forwarded.

*37*  
*37* 32. (New) The method of claim *21*, further comprising:

comparing a version number of an executable image stored at said node and a version number in said message corresponding to said executable image.

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~~38~~ <sup>37</sup> 33. (New) The method of claim ~~32~~, further comprising:

making a list of executable images stored at said node that require updating.

~~39~~ <sup>37</sup> 34. (New) The method of claim ~~32~~, further comprising:

if said comparison indicates that said executable image stored at said node requires updating,

requesting said master node forward a replacement executable, wherein said

replacement executable is a copy of an executable stored at said master

node corresponding to said executable image stored at said node, and

replacing said executable image stored at said node with said replacement executable.

~~40~~ <sup>32</sup> 35. (New) The method of claim ~~31~~, further comprising:

determining if a master node identified in said message is a master node identified in another message received by said node;

analyzing a hop count and a source node identified in said message, if said master

node identified in said message is said master node identified in said another

message, and

analyzing a node identifier of said master node identified in said message, otherwise.

~~41~~ <sup>40</sup> 36. (New) The method of claim ~~35~~, wherein said analyzing said hop count and said source node identified in said message comprises:

performing a first comparison between said hop count identified in said message and a hop count identified in said another message;

performing a second comparison between said source node identified in said message and a source node identified in said another message; and

dropping said message, if either of said first and said second comparisons fail, and determining if said message can be forwarded, otherwise.

~~42~~ <sup>41</sup> 37. (New) The method of claim ~~36~~, wherein said determining if said message can be forwarded comprises:

updating a hop count of said message;

comparing said hop count to a maximum hop count; and

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forwarding said message if said comparison indicates that said message can be forwarded.

*43*  
~~38.~~ (New) A method for maintaining topology information regarding a topology of a network, wherein said network comprises a plurality of nodes, comprising:  
sending a message from a master node to a backup node, wherein  
each of said nodes is communicatively coupled to another of said nodes by at least one of a plurality of optical links;  
receiving a reply from said backup node at said master node;  
comparing information in said reply regarding a backup database maintained on said backup node with information regarding an authoritative database maintained on said master node; and  
sending a copy of said authoritative database from said master node to said backup node, if said comparison indicates that said backup database should be updated.

*44*  
~~39.~~ (New) The method of claim ~~38~~, wherein said backup node and said master node are ones of said nodes.

*45*  
~~40.~~ (New) The method of claim ~~38~~, further comprising:  
receiving said copy of said authoritative database at said backup node; and  
replacing said backup database with said copy of said authoritative database.

*46*  
~~41.~~ (New) The method of claim ~~39~~, further comprising:  
forwarding said copy of said backup database from said backup node to a standby node.

*47*  
~~42.~~ (New) The method of claim ~~38~~, further comprising:  
sending a copy of a dynamic database from said master node to said backup node.

*48*  
~~43.~~ (New) The method of claim ~~42~~, further comprising:  
forwarding said copy of said dynamic database from said backup node to a standby node.

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~~49~~ <sup>43</sup> ~~44.~~ (New) The method of claim ~~38~~, further comprising:  
forwarding said copy of said backup database from said backup node to a standby  
node;  
storing said copy of said backup database as a standby database.

~~50~~ <sup>49</sup> ~~45.~~ (New) The method of claim ~~44~~, further comprising:  
maintaining synchronization between said authoritative database, said backup database  
and said standby database.

~~51~~ <sup>46.</sup> (New) A method for adding a path in a network, wherein said network  
comprises a plurality of nodes, comprising:  
performing path discovery at a master node, wherein  
each of said nodes is communicatively coupled to another of said nodes by at  
least one of a plurality of optical links,  
said path discovery is performed by a route processor associated with said  
master node,  
said path discovery is performed to identify said path, and  
said path is between a source node of said nodes and a destination node of said  
nodes; and  
if said path is successfully discovered,  
adding said path to a topology database, and  
 sending an update message to a backup node, said update message comprising  
information regarding said path.

~~52~~ <sup>51</sup> ~~47.~~ (New) The method of claim ~~46~~, wherein said backup node and said master  
node are ones of said nodes.

~~53~~ <sup>51</sup> ~~48.~~ (New) The method of claim ~~46~~, further comprising:  
sending a positive response from said route processor to a system controller of said  
master node, if said path is successfully discovered.

~~54~~ <sup>53</sup> ~~49.~~ (New) The method of claim ~~48~~, wherein said positive response comprises:  
an ordered list of hops, wherein said ordered list of hops represents said path, and said

path is between said source and said destination nodes; and a connection identifier, wherein said connection identifier uniquely identifies said path within said network.

*55* 50. (New) The method of claim *49*, further comprising: sending another positive response to said requestor, if said positive response is received by said system controller, and sending a negative response to said requestor, otherwise.

*56* 51. (New) The method of claim *46*, further comprising: sending information regarding said path to others of said nodes, if said path is successfully discovered.

*57* 52. (New) The method of claim *51*, wherein each of said others of said nodes is a standby node.

*58* 53. (New) The method of claim *51*, wherein said information regarding said path comprises an I/O map.

*59* 54. (New) The method of claim *51*, further comprising: communicating a reconfiguration message to ones of said nodes, said path comprising said ones of said nodes, if said path is successfully discovered.

*60* 55. (New) A method for deleting a path in a network, wherein said network comprises a plurality of nodes, comprising:

receiving a deletion request at a route processor of a master node, wherein said deletion request comprises a connection identifier, said connection identifier identifies said path, said path is between a source node of said nodes and a destination node of said nodes, said path comprising a plurality of said nodes, said plurality of said nodes comprises said source and said destination nodes, and

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each of said nodes is communicatively coupled to another of said nodes by at least one of a plurality of optical links;

communicating a reconfiguration message to each of said plurality of said nodes; and deleting said path from a topology database, if said path is successfully deleted.

*61*<sub>56</sub>. (New) The method of claim *55*, further comprising:

sending an update message to a backup node, said update message comprising information regarding said path, if said path is successfully deleted.

*62*<sub>57</sub>. (New) The method of claim *56*, wherein said backup node and said master node are ones of said nodes.

*63*<sub>58</sub>. (New) The method of claim *56*, further comprising:

determining if said connection identifier is valid; and sending a negative response from said route processor to a system controller of said master node, if said connection identifier is not valid.

*64*<sub>59</sub>. (New) The method of claim *56*, further comprising:

sending a positive response from said route processor to a system controller of said master node, if said path is successfully deleted.

*65*<sub>60</sub>. (New) The method of claim *59*, further comprising:

sending another positive response to said requestor, if said positive response is received by said system controller, and sending a negative response to said requestor, otherwise.

*66*<sub>61</sub>. (New) The method of claim *56*, further comprising:

communicating a reconfiguration message to ones of said nodes, said path comprising said ones of said nodes, if said path is successfully deleted.

*67*<sub>62</sub>. (New) A method for changing a path in a network, wherein said network comprises a plurality of nodes, comprising:

receiving a connectivity change request at a master node, wherein

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said path is between a source node of said nodes and a destination node of said nodes,

said path comprising a plurality of said nodes,

said plurality of said nodes comprises said source and said destination nodes,  
and

each of said nodes is communicatively coupled to another of said nodes by at  
least one of a plurality of optical links;

determining if ones of said nodes affected by said connectivity change request can be  
configured to effect said connectivity change request; and

updating a topology database to reflect a change in said path effected by said  
connectivity change request, if said ones of said nodes affected by said  
connectivity change request can be configured to effect said connectivity  
change request.

*61*  
*68* *63.* (New) The method of claim *62*, wherein said determining is based on at least  
one of:

a current state of said network,  
a service available in said network, and  
a service requested in said connectivity change request.

*69* *64.* (New) The method of claim *62*, wherein said determining comprises:  
sending a notification from said master node to said source node, for example, to  
initiate the identification of a new physical path.

*70* *65.* (New) The method of claim *64*, wherein said sending determining further  
comprises:  
initiating identification of a new physical path from said source node.

*71* *66.* (New) The method of claim *62*, wherein  
said connectivity change request comprises a connection identifier, and  
said connection identifier identifies said path.

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72. (New) The method of claim 62, further comprising:  
67 sending an update message to a backup node, said update message comprising  
information regarding said path, if said ones of said nodes affected by said  
connectivity change request can be configured to effect said connectivity  
change request.

73. (New) The method of claim 61, wherein said backup node and said master  
node are ones of said nodes.

74. (New) The method of claim 62, further comprising:  
67 communicating a reconfiguration message to said ones of said nodes affected by said  
connectivity change request, if said ones of said nodes affected by said  
connectivity change request can be configured to effect said connectivity  
change request.

75. (New) The method of claim 69, further comprising:  
74 committing a connectivity change requested in said connectivity change request, if  
said ones of said nodes affected by said connectivity change request can be  
configured to effect said connectivity change request.

76. (New) The method of claim 62, further comprising:  
67 sending a positive response from said master node, if said ones of said nodes affected  
by said connectivity change request can be configured to effect said  
connectivity change request.

77. (New) The method of claim 71, further comprising:  
76 communicating a reconfiguration message to said ones of said nodes affected by said  
connectivity change request, if said master node sends a positive response.

78. (New) The method of claim 72, further comprising:  
77 committing a connectivity change requested in said connectivity change request, if  
said master node sends a positive response.